Ministry of Forests
Growth and Yield Program
for 2000/01

Overview

1 Summary

The Ministry of Forests Growth and Yield Program is an inter-branch program of field measurements, research activities, applications development and extension activities related to growth and yield. It provides data and tools needed for essential tasks such as inventory projection, planning silvicultural treatments, calculating stumpage revenues and determining allowable annual cuts.

Responsibility for delivering the Growth and Yield Program is shared by three branches (Research Branch, Resources Inventory Branch, Forest Practices Branch) and all six Forest Regions. Strategic direction for the program is taken from annual and 5-year plans developed by the Forest Productivity Council of British Columbia.

The MOF Growth and Yield Program Coordinating Committee coordinates and integrates the program across branches and regions, and ensures that it meets the needs of all users. It is also responsible for approving the release and use of growth and yield products for internal Ministry of Forests use.

2 Introduction

The Ministry of Forests (MOF) Growth and Yield Program is an inter-branch program of field measurements, research activities, applications development and extension activities related to growth and yield. It provides data and tools needed for essential tasks such as planning silvicultural treatments, calculating stumpage revenues and determining allowable annual cuts.

This report describes the program, how it is delivered and issues related to its delivery.

3 Program Description

The ministry's Growth and Yield Program is the shared responsibility of three headquarters branches and all six Forest Regions. The branches include:

- Resources Inventory Branch—Resources Inventory Operations Section;
- Research Branch—Forest Productivity Section; and
- Forest Practices Branch—Silvicultural Practices Section.

The growth and yield program also involves people outside the ministry, including the Canadian Forest Service (CFS), universities, industry, consulting firms and growth and yield cooperatives.

The ministry's Growth and Yield Program Coordinating Committee (GYPCC), comprising representatives of the three branches delivering the program, Timber Supply Branch and Operations Division, is responsible for coordinating delivery of the program, approving growth and yield products for MOF use, and ensuring that user needs are met by the program.

Strategic direction for the program is taken largely from plans developed by the Forest Productivity Council of British Columbia (FPC). The FPC is a cooperative body, composed of representatives of the major forestry associations, the MOF, forest industry companies, and universities. Each year, the Council recommends an annual plan of operation and a five-year strategy for province-wide activities in growth and yield. The strategies and plans developed by the Council are used by the MOF GYPCC to guide the development of the Ministry's Growth and Yield Program.

Resources Inventory Branch— Resources Inventory Operations Section

Within the Resources Inventory Branch (RIB), the Resources Inventory Operations Section has maintained a program of operational growth and yield activities since the 1950s. The program's focus is to support inventory activities by supplying growth and yield estimates and predictions for all stand conditions encountered across the province for use in inventory update and projection.

The Permanent Sample Plot (PSP) Program (established in 1961) is RIB's largest program and is funded and implemented at the regional level. (These data, together with Experimental Plots from Research Branch, are the primary data collection effort carried out by the ministry for growth and yield.) RIB no longer funds data collection. Instead, RIB develops programs, standards, and software that support field work and develops growth and yield tools and applications (e.g., VDYP). RIB also provides training, quality assurance and data management for the program.

RIB's Growth and Yield Program is currently being integrated with the Provincial Inventory Program to ensure close linkages.

Clients

The major clients and uses for products of the RIB growth and yield program are:

- Chief Forester - natural stand yield projections used in the Timber Supply Review
- Revenue Branch - tree-volume and decay estimates for stumpage appraisal
- Research Branch - tree-volume and decay estimation, inventory and permanent sample plot (PSP) data
- Regions and Districts - data and tools to support planning
- Industry - all of the above

Staff

Staff resources delivering the RIB growth and yield program include:

Volume and Decay	2 professionals, 1 technician
Growth Data	1 professional, 1 technician & 6 regional professional positions
Data Management	1 professional, 1 technical & 1 clerical
Growth Projections	2 professionals
Program Management	2 professionals

Research Branch – Forest Productvity Section

Primarily, staff in the Forest Productivity Section (FPS) carries out the growth and yield work conducted in Research Branch (RB), although other branch staff conduct some research and data collection. The FPS is includes two sub-sections:

- **Stand Modeling:** responsible for work in stand modeling, site productivity and approval of managed stand yield predictions.
    - Stand Modeling Research - The development, release and support of models for projecting volume and other values for the complete range of treatments and site types in the province. While stand modeling was originally focused on managed stands (e.g., TASS, TIPSY, SYLVER), recently it has focused on understanding and predicting stand development in complex stands (particularly in the ICH and in the IDF biogeoclimatic zones). Most resources are currently committed to data collection in these types. This group includes Research Branch's contribution to Prognosis development.
    - Site Productivity Research - Estimates of site quality (e.g. site index curves, growth intercepts, SIBEC, OGSI type adjustments).
    - Yield Prediction Approvals - Approval of managed stand yield tables and site index projections for TFL management plans. Provides support to Timber Supply Branch as needed for yield projections used in TSR timber supply analyses.
- **Forest Dynamics and Silviculture:** consists of two sub-groups with one responsible for growth and yield field experiments and the other responsible for silviculture research in areas such as broadleaf and mixedwood management, vegetation management and silviculture systems. Many of the silviculture projects in the latter sub-group have a significant growth and yield component. Staff are located in Victoria, Vernon and Prince George.
    - Field Experiments: design, establishment, remeasurement, analysis and reporting on growth and yield experiments (treatment responses, etc.). These data, together with PSPs from RIB, are the primary data collection effort carried out by the ministry for growth and yield. Data collection efforts are guided by the FPC matrix (see section on strategic planning, below). Field experiments are subdivided further into Coastal Experiments, Interior, and Nutrition.

Clients

The clients of RB's growth and yield program include:

- Chief Forester and Timber Supply Branch - site index and yield estimates and approvals in support of TSR.

- MOF Executive and other senior management - expertise and advice on issues, policy development related to growth and yield (e.g., Stand Density Management Guidelines, Weyerhaeuser's variable retention strategy).
- Forest Practices Branch - as for Executive, plus support for silviculture planning.
- Resources Inventory Branch - managed stand yield projections for the inventory system.
- Districts and Regions - data and tools for planning (e.g., silviculture prescriptions) and extension.
- Industry - growth and yield tools and applications (e.g., site index, growth intercepts, yield models) and yield projections for timber supply analysis.

Staff

Staff resources delivering the RB growth and yield program include:

Stand Modelling	7 scientists and 2 technicians
Site Productivity Research	1 scientist plus contributions from others
Yield Prediction Approvals	1 professional
Field Experiments	3 scientists and 4 technician (staff located in Victoria, Vernon and Prince George)
Other Contributing Staff	11 scientists, professionals and technicians (available as required, whose primary function is not growth and yield)

Forest Practices Branch – Silvicultural Practices Section

The Silviculture Practices Section of the Forest Practices Branch (FPB) is responsible for the legislation, policy, and procedures that pertain to the regulation of forest practices. Many FPB activities have some connection to growth and yield. Though FPB is primarily a user of growth and yield products, a small number of technical specialists within FPB are involved in developing growth and yield products, providing advice and extension, and working on various growth and yield coordinating committees.

The FPB supports growth and yield activities through:

- the development of PrognosisBC and other tools to estimate site productivity;
- technical support to clients on interpretations of growth and yield where it pertains to forest practices.

Clients

The principal clients of FPB include:

- Chief Forester and MOF executive
- District Managers and staff
- Regional Managers and staff
- Industry
- Consulting

- Forest Renewal BC
- Other stakeholders

Staff

Staff resources delivering the FPB growth and yield program include:

PrognosisBC	1.1 professionals
Site Productivity	1.1 professionals
GY Program Coordinator	0.3 professional
Other Contributing Staff	7.5 professionals (who are involved in the development or use of GY tools and related applications to support forest practices standards and decision making.)

4 Budgets

Table 1. Resources for growth and yield programs of Resources Inventory Branch (RIB), Research Branch (RB) and Forest Practices Branch (FPC) for 2000/01.

Funding Source		FTE	Operating budget ($000)	Total budget ($000)
RIB	Base	9.5	115	763
	Forest Renewal Plan	2.5	1,047	1,285
	All Sources	***12.0***	***1,162***	***2,048***
RB	Base for GY	15.8	29	1,068
	Forest Renewal Plan for GY	2.7	1,589	1,740
	All Sources for GY	***18.5 dedicated***	***1,618***	***2,708***
	Silviculture	***11.0 partial[1]***	***365***	***1,008***
FPB	Base	5.0 partial[2]	33	33
	Forest Renewal Plan	3.0 dedicated 2.0 partial[2]	718	943
	All Sources	***3.0 dedicated***	***718***	***943***
		7.0 partial[2]	***33***	***33***
All Branches		**33.5 dedicated** **18 partial**	**3,498** **398**	**5,699** **1,041**

[1] The Research Branch figures includes the entire stand modeling group but only the field experiment component of the silviculture group. The silviculture group contributes through field experiments that have a silviculture focus but can be used for growth and yield modeling. It is impossible to accurately determine what portion of the silviculture research program contributes directly to the growth and yield program.

[2] The Forest Practices Branch has included staff whose primary role is not growth and yield. However, these are acknowledged as staff who lead, coordinate or administer contracts and studies that have a direct linkage to growth and yield information development or application.

5 Strategic Planning

The GYPCC takes strategic direction for the MOF Growth and Yield Program from the annual and 5-year plans of the Forest Productivity Council. The FPC's plans, which identify and rank growth and yield projects according to provincial needs, are used by MOF as a guide for determining priorities for its own program. The FPC's "matrix" identifies six project areas:

1. Site Productivity
2. Volume & Decay
3. Stand Level Applications
4. Forest Level Applications
5. Forest Health
6. Habitat / Biodiversity

6 Issues

Certain issues impede delivery of the growth and yield program:

1. Funding security and continuity. For many growth and yield activities, long-term participation is essential (e.g., growth and yield data collection) and finding sources of funds are a continual problem for the MOF program. Increasing reliance on industry partners makes it more what?
2. Participation. There is reluctance by most companies to participate in growth and yield programs and for those that do, a significant effort is required by the MOF to train and assist companies that want to participate.
3. Lack of guidance. While taking guidance from FPC plans is theoretically desirable, stronger leadership and priority setting is needed.
4. Lack of resources. MOF resources have been overwhelmed by the need to deal with emerging issues (e.g., partial cutting).

Growth & Yield Priorities 2000/01
Research Branch - Forest Productivity Section

Priority Issue	Description of Need	Clients
Improvement of site productivity estimates	More work is needed on potential adjustments of inventory-based site index estimates, particularly for younger stands. Current priorities are SIBEC, methods for estimating productivity in complex stands and juvenile height growth models (which contributes to the need to estimate actual versus potential height growth).	Chief Forester and TSB (for TSR), FPB, district silviculturists Also Forest Productivity Council and industry
Development of a silviculture research strategy	With increased use of non-clearcutting harvest systems, there is an urgent need for a strategy for silviculture research that will guide research for the near future.	Ultimately FPB and operational/field staff, TSB
Growth and yield models are needed for application in complex stands and for partial cutting	Data needs to be collected and models developed that will provide yield estimates for various treatments applied to complex stands. Models are most urgently needed for the boreal mixedwood, IDF and ICH. Information on stand development patterns will contribute to an understanding of how non-contributing forest lands impact timber supply.	TSB (for TSR), FPB, RIB (for IPS) Also FPC, industry, FRBC
Adjustment factors for application in existing growth and yield models	Operational adjustment factors must be added to existing growth and yield models such as TIPSY to account for the impacts of forest health losses, management practices such as brushing and fertilization, and biodiversity requirements (e.g., wildlife trees). Over the short-term, will need to use BAI to provide estimates of these impacts.	TSB (for TSR), FPB, TIB????, RIB, district silviculturists
Prediction of early stand development (for free growing and greenup)	Accurate estimation of early stand development under a variety of management treatments (such as brushing) and site conditions (e.g., hardwoods on the site) is essential to estimating time to free growing and greenup.	FPB, TSB, district silviculturists (for SPs), industry (liability concerns)
Stocking standards for hardwoods and mixedwoods	Increased harvesting of mixedwood and broadleaf stands requires appropriate stocking standards for these stand types.	FPB, district silviculturists, industry
Growth and yield support for TSR and district silviculture staff	Staff approve yield information submitted by TFLs. With the increased use of non-traditional harvesting patterns, TSB and district silviculture staff require assistance in projecting yields from partial harvesting.	Chief Forester and TSB (TSR), FPB, districts
Support for EFMPPs, IFPAs, and other initiatives.	Staff support Regions in the review of yield information submitted by IPFAs and will provide assistance with silviculture investment strategies. Ongoing support for EFMPPs is also provided.	Chief Forester and TSB, FPB, districts, IFPAs and EFMPP pilots
Support for Forest Productivity Council Working Groups	FPC working groups require active support from RB staff. WGs develop strategies and work plans, define priorities, and set standards for growth and yield information.	Chief Forester and TSB (TSR), FPC
Silviculture support for district staff	Support district silviculture staff through consultation and extension in stand establishment and tending. Current focus is on complex stands, especially conifer-broadleaf mixtures.	Districts, FPB

Growth & Yield Priorities 2000/01

Resources Inventory Branch - Resources Inventory Operations Section

Priority Issue	Description of Need	Clients
Provincial program strategies	The Chief Forester receives advice on growth and yield and inventory matters from the Forest Productivity and Forest Resources Inventory Councils. RIB maintains the two councils and their working groups.	Chief Forester, MOF, industry
Implement new single tree volume (taper) prediction model	In 1995, the Growth and Yield Steering Committee (now GYPCC) recommended that all new inventory predictive tools be stratified on the BEC System. The Kozak Variable Exponent Taper Model was re-estimated on BEC Zones. Implementation will be coordinated with the release of VDYP7 and the new single tree/stand-level decay/waste-2 and models (Beta release August 2000, operational release, April 2001).	All clients requiring single tree volumes to include: inventory, growth and yield modellers, cruise compilation/revenue
Implement new single tree decay/waste2 predictive models	Decay and non-recoverable waste (waste-2) single tree models based on BEC stratification will be released in concert with the revised taper model. These models can be used as OAFs against output for a number of models.	All clients requiring single tree volumes to include: inventory, growth and yield modellers, cruise compilation/revenue
Sample compilers and data warehouse	Sample compilers are available for all sample types compiled by RIB. A new audit sample compiler will be released in August 2000. All other compilers are enhanced and upgraded to take advantage of new component models.	RIB, RB, Revenue Br, industry, consultants
Permanent Sample Plot Program	RIB maintains the Provincial PSP Program to include: design, standards, Q/A, sample processing and assisting the regions and industry who manage all field work. RIB directly purchases PSPs from two coastal TFLs who maintain private programs.	RIB, RB, FPB, industry, consultants, academia
Inventory Prediction System	IPS is a conceptual architecture that will house a number of growth and yield predictive tools used to update and project the inventory. VDYP7 is the latest stand level growth and yield model to be developed by RIB for release in April 2001. VDYP7 has been developed on growth data stratified by BEC. The model will run against both pre-RIC and RIC compliant standards (adjusted inventories). Provision for localization is a major feature. RIB, in concert with northern cooperators, is adapting the Alberta Mixedwood Growth Model (MGM) for operational release in January 2001.	Chief Forester, TSB, industry, contractors
Growth and yield support for TSR and district silviculture staff	Staff approve natural stand yield information submitted by TFLs in cooperation with staff from Research Branch.	Chief Forester and TSB (TSR), FPB, districts
Support for EFMPPs, IFPAs and other initiatives	Staff support regions in the review of yield information submitted by IPFAs and will provide assistance with silviculture investment strategies. Ongoing support for EFMPPs is also provided.	Chief Forester and TSB; FPB, districts, IFPAs and EFMPP pilots
Monitoring protocol development	In 1996, RIB was requested by the GYPCC and the FPC to develop monitoring protocols to provide feedback data for growth and yield predictive tools. A Growth and Yield Monitoring Task Force recommended protocols for implementation at the provincial, management unit and stand level. Based on VRI sample theory, sample designs are complete for national and management unit application. A five-year program for provincial sampling will commence in field season 2000. Management unit sampling will be piloted on a number of sites.(does it matter that this is out of date – i.e., already started??)	Chief Forester and TSB (TSR), FPC, industry, consultants

Growth & Yield Priorities 2000/01

Forest Practices Branch - Silvicultural Practices Section

Priority Issue	Description of Need	Clients
Training and extension	The 1997 GY Modelling Strategy for BC indicated that training and extension in growth and yield was one of the key user priorities. The 1998 Essa review of EFP training needs assessment re-confirmed this. Silviculturists need training in the use of stand level decision aids, survey procedures and timber supply planning to design effective silviculture regimes. In order for operational staff to deviate from standard guidelines (i.e., stocking standards, stand tending) they need training in silviculture survey data collection and how to incorporate decision aids in prescription development.	Regional, district, licensee and consulting silviculturists and planners
Development of operationally oriented guidelines, tools and survey procedures	About 75% of second growth forests in BC are mixed species and complex stands. There are 600 ecosystems, 22 tree species, 6 silviculture systems, and 6 major silviculture treatment types in BC. Silviculturists require operationally oriented decision tools and silviculture survey procedures to collect and analyse information to develop prescriptions. They require tools that have been calibrated or audited for suitability for use on areas (e.g., IDF, Fdc GI).	Regional, district, licensee and consulting silviculturists. Ultimately RIB and TSB
Development of silviculture strategies	FRDA 1 and 2 audits and the recent FRBC audit have raised the concern about a lack of strategy for the investment in backlog and incremental silviculture. The MOF needs to communicate its stewardship priorities and objectives to industry who is the prime deliverer of FRBC silviculture activities. FRBC activities need to be designed to consider TSR assumptions, current issues and opportunities for silviculture investments. Silviculture strategies need to be designed so that silviculture investments can be wisely deployed to enhance or maintain timber supply, wood quality and habitat supply. Silviculture strategies need to be developed to give context to SMPs and bSPs.	FRBC, regional, district, licensee and consulting silviculturists and planners
Development of habitat tools and information	Maintenance of biodiversity and habitat supply is a significant issue. Habitat and biodiversity issues are often landscape or forest level issues. Silviculturists require guidelines and information on where and what types of stand conditions are needed and they need tools to design silviculture regimes that can achieve the desired target stand conditions. MELP and silviculturists require information on the impact of intensive silviculture on habitat and biodiversity.	Regional and district silviculture strategy planners, MELP, regional, district, licensee and consulting silviculturists. Ultimately TSB
Forest health decision tools and information	Forest health impacts must be more fully understood and incorporated in silviculture prescriptions, TSR and silviculture strategies. The impacts of mistletoe, root rots and other agents must be better accounted for in yield projections at the stand and forest level. Methodologies for collection of forest health information and impacts need to be developed.	Timber Supply Branch, regional forest health specialists, regional, district, licensee and consulting silviculturists

Ministry of Forests

Growth & Yield Program Projects for 2000/01

Project Title (funder)	Linkages	Lead Branch	Lead Person	Cost	When Finished	Comments
Modelling						
Development of growth and yield decision support tools (SCBC) Is the bracketed info the funder? If so, maybe it should be in the cost column and it should be indicated in the above column	TSB, FPB and RIB (for IPS) Also FPC, industry and FRBC	RB	Ken Mitchell	$385,000	March, 2001	• Increased focus on yield estimates for complex stands with continuation of work at Pothole Creek • Enhancements to TASS, Tipsy, SiteTools, SYLVER, VISTAS and FAN$Y • New version of Tipsy to be released this spring – includes CT, fertilization, genetic gain and clumped distributions • Examining inclusion of alder, birch and aspen in TASS
Modelling impact of silviculture activities on wood characteristics of western hemlock (SCBC)	TSB, FPB, TIB, RIB, district silviculturists	RB	Jim Goudie	$51,000	March, 2002	• In second last year of project • Most deliverables will be in last year but model validation to be started
PrognosisBC (FRBC)	TSB, FPB, district staff, industry	RB	Abdel-Azim Zumrawi	(see comments)	March, 2001	• Joint project with FPB – salaries and operating budget covered in FPB project list (what project list is this?)
Stand modelling operations and consultations (base)	TSB, FPB, district staff, industry	RB	Ken Mitchell	$20,000	Ongoing	• Staff support (Harper) for MGM development • Customized TASS runs for clients: FPB, districts, industry and consultants (e.g. silv. investment strategies) • Support for FPB on investigating inclusion of aspen in TASS and use of TASS & VISTAS for mixedwood stocking issues • Extend work on operational adjustment factors (OAFs) • Maintaining and updating Web growth and yield content • Ensuring SCBC projects properly archived
Inventory Prediction System (IPS)		RIB				
VDYP7 - A new growth and yield model is required to project the Vegetation Resources Inventory (VRI)	RIB to update the provincial inventory TSB - yield projections Industry - as above	RIB	Rob Drummond	$70,000	Beta version - Fall 2000, operational release - Spring 2001	VDYP7 will take advantage of new adjusted inventory variables to include: basal area, quadratic mean diameter, stems per ha. The model has four stages: 1. Inventory preparation, 2. Growth increment using basal area as the driver, 3. Conversion to yield, and, 4. Reduction for decay, waste-2 and breakage. VDYP7 is modular and flexible to take advantage of new components such as site and decay models. Growth predictions will be adjusted to reflect operational stand conditions using audit and other statistically relevant data sets.

Project Title (funder)	Linkages	Lead Branch	Lead Person	Cost	When Finished	Comments
Mixed Growthwood Model (MGM)	Chief Forester, TSB, RIB, industry, academia	RIB	Jon Vivian (RIB) Richard Kabzems & George Harper (RB)	$30,000	TSR - January 2001 Inventory - 2002	MGM is being adapted for use in the boreal mixedwood forests. A multi-disciplinary team provides guidance for BC development. Dr Titus will be on a six month sabbatical in 2000 to incorporate changes outlined in an MGM workshop. MGM is supported by a multi-agency Project Charter
Volume & Decay	Chief Forester, TSB, RIB, RB, Revenue Br, industry	RIB	Ken Richardson	Embedded in monitoring budget/salary	Annual	Volume (taper) and decay/waste-2 models are re-calibrated on a five year basis. No further plans to re-calibrate are envisaged for some time. Provision for localization occurs via: 1 Management Unit VRI NVAF sampling: this adjusts total sample volume; and 2 Regional adjustment: as NVAF data accrue from various surveys, a regional bias adjustment may be made
Prognosis development and implementation	TSB, RIB, RB, FPB District and industry silviculturists, industry and consulting timber supply planners	FPB	Abdel-Azim Zumrawi Barry Snowdon	$296,000	March 31, 2001 for the following projects in the comment column	The Plan for 2000/2001 • Document all changes made between the pilot version and version 2 • Finish the BEC based mortality model for conifers and hardwoods in the Nelson and Kamloops Regions • Build a BEC based large tree DBH model • Build a BEC based large tree height model • Implement RIB's BEC based volume equations and DWB factors • Sample the ICHmw2 for shade tolerant species growing under open conditions • Build and implement a small tree height growth model for the ICHmw2, IDFdk1,2&3 • Sample mistletoe invested stands to further test and develop the mistletoe model • Finish last years BEC classification of the IDFdk3 sample plots • Commence development of a regeneration model for the ICHmw2, IDFdk1,2&3 based on imputation methodologies • Demonstrate the tree list imputation methodologies in three TSAs • Deliver more training sessions
Modeling Total				**$852,000**		
Data Capture						
Interior forest nutrition GY experiments (SCBC)	GY modellers, district staff, industry, FPC	RB	Rob Brockley	$194,000	March, 2001	• Remeasure and maintain fertilization installations • Develop prototype decision tool for estimating fertilization response potential of lodgepole pine
Interior stand management GY experiments (SCBC)	GY modellers, district staff, industry, FPC	RB	Wayne Johnstone	$82,000	March, 2001	• Remeasure and maintain EP installations • Document via progress reports • Planned pub on 40 yr partial cutting trial in ICH (EP370b)
Coastal field experiments (SCBC)	GY modellers, district staff, industry, FPC	RB	Louise de Montigny	$377,000	March, 2001	• Remeasure and maintain EP installations • Establish silvicultural systems experiment • Extension notes on pruning and fertilization

Project Title (funder)	Linkages	Lead Branch	Lead Person	Cost	When Finished	Comments
Client support (base)	District staff, industry	RB	Wayne Johnstone, Louise de Montigny	$5,000	Ongoing	• Client consultations • Essential staff training • Ensuring all SCBC projects properly archived • Travel for Stand Mgt Coop (SMC)
RIB PSP Program Maintenance of provincial PSP Program	RIB, modellers RB, modellers FPC, industry, academia, other provinces	RIB	Joe Braz (RIB) Regional GY Foresters	$400,000	Ongoing to include: Data download, Training/Q/A, Data processing, Upgrade of field procedures, manuals, EFR, FPC Header database & associated software	RIB provides a development and maintenance role for the PSP Program. RIB implements direction from both the GYPCC and FPC on an annual basis. The program is updated annually through a change management process. All field work is performed by the regions who are charged with finding budget, contracting and supporting industry with their initiatives. RIB annually purchases priority PSP data from two coastal TFLs. Former treated stand programs have been halted under direction of the FPC. RIB has completed a ten year program to validate and compile all PSP data (30,000+ measurements). All data must be collected on EFRs. A new height-diameter algorithm will be implemented in 2000.
Cariboo FR PSP	RIB, modellers RB, modellers FPC, industry, academia, other provinces	Region	Sam Davis	$834,800	Annual	No. Plots / Cost Establishment: 70 / $500,000 Remeasurement: 140 / $144,800 Ecological Assessment: / $ 90,000 Maintenance: / $ 15,000 Industry: / $ 55,000 Assist industry: / $ 30,000
Kamloops FR PSP	RIB, modellers, RB, modellers, FPC, industry, academia, other provinces	Region	Bob Macdonald	$176,000	Annual	No. Plots / Cost Establishment: Remeasurement: 56 / $112,000 Ecological Assessment: Maintenance: / $ 64,000 Industry: Assist industry:
Nelson FR PSP	RIB, modellers RB, modellers FPC, industry, academia, other provinces	Region	Cal Hauk	$505,000	Annual	No. Plots / Cost Establishment: 20 / $ 20,000 Remeasurement: 68 / $ 70,000 Ecological Assessment: (SIBEC) / $415,000 Maintenance: Industry: Assist industry:
Pr. Geo. FR PSP	RIB, modellers RB, modellers FPC, industry, academia, other provinces	Region	Larry Badowski	$48,000	Annual	No. Plots / Cost Establishment: 19 / $ 30,000 Remeasurement: 26 / $ 8,000 Ecological Assessment Maintenance: / $ 10,000 Industry: Assist industry:
Prince Rupert FR PSP	RIB, modellers RB, modellers, FPC, industry, academia, other provinces	Region	Bobby Love	$91,200	Annual	No. Plots / Cost Establishment: Remeasurement: 58 / $ 87,000 Ecological Assessment Maintenance: Industry: Assist industry: / $ 4,200

Project Title (funder)	Linkages	Lead Branch	Lead Person	Cost	When Finished	Comments
Vancouver FR PSP	RIB: modellers RB: modellers, FPC: industry, academia, other provinces	Region	Kevin Hardy	$220,000	Annual	No. Plots / Cost Establishment: 85 / $222,000 Remeasurement: 10 / $ 9,000 Ecological Assessment: Maintenance: Industry: Assist industry:
Monitoring Development Monitoring protocols are being developed for application at three levels	Chief Forester, FPC, TSB, RB, Revenue Br., industry	RIB	Jon Vivian	See below	See below	RIB was directed to develop monitoring protocols to check growth and yield predictions. This project includes both general monitoring protocols for the inventory (change inventory), as well as directed growth and yield monitoring for hypothesis testing. Monitoring will be implemented at three levels: provincial, management unit and stand level.
1. Provincial (national) level monitoring	International, Canada, BC	RIB	Jon Vivian	300,000	2004/ five-year cycle	Provincial monitoring will form the basis for BC's contribution to the National Forest Inventory. There are two components: 1. Photo Estimation Phase: Using the provincial GIS inventory, 2,400 4 by 4 km square samples will be "drilled" and summarized by five eco-zones. 2. Ground Sampling Phase: Approx. 320, 0.04 ha plots will be established over five years throughout BC. They will include all VRI ground sample attributes and will be remeasured every five years. Information on stand dynamics, course woody debris, biomass, etc., will be appended to Phase I samples and summarized by eco zone. These data will also be used for provincial reporting.
2. Management unit level monitoring	Chief Forester, TSB, RIB, industry	RIB	Jon Vivian	75,000	2001	Management level application will be piloted on at least two sites (TFL 35 & Babine EFMPP) in 2000. Licensees have design flexibility based on the intended use of the data. Samples may be established as part of a general VRI project to provide change inventory data over time. More intensive directed growth and yield projects will be established in targeted strata (e.g., managed stands) to test model output (hypothesis testing).
3. Stand level monitoring	Chief Forester, silviculturalists, forest health, growth and yield tool developers	RIB	Jon Vivian	Included in M.U.	2001/2	Stand level application is still under development. It is envisaged that sampling protocols will be based on enhanced silviculture surveys to provide feedback data on early stand development, e.g., free-to-grow. Three major factors are essential for the success of this: 1. Data management: access to existing repeated silviculture survey data would answer many questions put to the GYMTF. Over-writing earlier surveys, or lack of access prevents this. 2. Continuation: There is some concern over the future of these surveys. 3. Statistical integrity: Monitoring data must be statistically rigorous; biased field procedures are untenable.
Data Capture Total				**$3,308,000**		

Project Title (funder)	Linkages	Lead Branch	Lead Person	Cost	When Finished	Comments
Site Productivity						
Improvement of site productivity estimates (FRBC)	Chief Forester and TSB, FPB, district silviculturists Also Forest Productivity Council and industry	RB	Gordon Nigh	$275,000	March, 2001	• More work is needed on potential adjustments of inventory-based site index estimates, particularly for younger stands • Current priority from FPC is juvenile height growth modelling (which contributes to interest in estimation of actual versus potential height growth) • Continuing work on SIBEC data collection and height-age curves, OASIS manual • Maintenance of stem analysis data base • FPB also has projects
SIBEC (FRBC)	As above	RB	Shirley Mah	$70,000	March, 2001	• SIBEC database – analysis and maintenance • Deciduous supplement for SIBEC
Site productivity estimates for complex stands (FRBC)	As above	RB	Keith Thomas	$94,000	March, 2001	• Methods for estimating productivity in complex stands is a high priority for Forest Productivity Council
Site Productivity Applications support	TSB, RIB, RB, FPB District and industry silviculturists, industry and consulting timber supply planners	FPB	Pat Martin	$53,000	March 31, 2001	The Plan for 2000-2001 • Coordinating and assisting in the continued update of the Site Productivity website • Audit of Fdc growth intercept tool performance on silviculturally treated stands • Complete the ISIS/MLSIS site index update to ensure site index available for up to 7 million hectares in the system. • Extension of results from completed projects
Site Productivity Total				**492,000**		

Infrastructure (overhead, coop membership, travel)						
RIB program maintenance	GYPCC, FPC, Chief Forester, other branches, industry	RIB	Jon Vivian	$115,000	Annual	The Resources Inventory Operations Section is comprised of an inventory and a growth and yield component. RIO has been directed to integrate growth and yield activities within the inventory with a strong statistical base, where appropriate. The principal clients are: RIB, TSB, RB, Revenue Br. & F.PB, industry, academia
Provincial program strategies	Chief Forester, GYPCC, other branches, industry	RIB	Jon Vivian	$275,000	Annual	RIB provides total support for the FPC and FRIC Councils to include: secretariats, councilors, TAC and Working Group fees, travel and contract support

Project Title (funder)	Linkages	Lead Branch	Lead Person	Cost	When Finished	Comments
Cooperatives	As above	RIB	Jon Vivian Richard Kabzems	$20,000	Annual	RIB maintains membership in the WESBOGYand INGY Cooperatives
Travel	As above	RIB	Jon Vivian	Embedded in projects	Annual	All travel is built into each program/project
Forest Productivity Council support	FPC, Chief Forester	RB	Barrie Phillips	(costs covered elsewhere)	Ongoing	FPC working groups require active support from RB staff. WGs develop strategies and work plans, define priorities and set standards for growth and yield information
Cooperatives (SMC, Wesbogy, INGY, HSC)		RB	Phillips and de Montigny	(see comments)	Ongoing	Dues either covered by others or fees waived through support-in-kind
Prognosis Development Team	TSB, RIB, RB, FPB District and industry silviculturists, industry and consulting timber supply planners	FPB	Abdel-Azim Zumrawi, Barry Snowdon	$150,000	Ongoing annual salaries	Annual salaries to support two excellent employees
Infrastructure Total				**$560,000**		
Data Management & Systems						
Results data warehouse	RIB, RB, industry	RIB	Alf Kivari	$210,000	2000	Compilers for all sample types have been developed over the past five years. The Audit Sample Compiler will be completed this summer. Compilers and compiled samples are housed in a SAS Results Data Warehouse. Raw data are validated and stored on an Oracle Relational database. Developments for 200 include: integration of a new height-diameter and volume/decay algorithms, web-site access (if feasible), general maintenance.
PC level application maintenance	As above	RIB	Joe Braz, Cam Bartram, Ken Richardson	Embedded in projects	Annual	See PSP Program, IPS, volume and decay
Updating and maintaining GY data base	GY modellers, industry, consultants	RB	Frank van Thienen	(covered in other projects)	Ongoing	• Training of some staff to update data yearly • Training of other FPS staff to use system for reporting
Stem analysis database	As above	RB	Gord Nigh	(see comments)	Ongoing	Costs are covered under "site productivity"
Data Management & Systems Total				**$210,000**		

Project Title (funder)	Linkages	Lead Branch	Lead Person	Cost	When Finished	Comments
MOF/Industrial Support						
Enhanced Forest Management Pilots (EFMPPs)	EFMPP Steering Committee, the Pilots, industry, Districts	RB	Barrie Phillips (TAC chair)	(see comments)	March, 2001	• Funds for TAC operations held at CPPB; estimated budget is $5,000. • Only a portion of support is related to GY
Other initiatives IFPAs, silviculture strategies	Regional Managers, IFPA holders, FPB, industry	RB	Barrie Phillips	(covered elsewhere)	Ongoing	Staff support Regions in the review of yield information submitted by IPFAs and will provide assistance with silviculture investment strategies.
TSR	Chief Forester, TSB	RIB	Rob Drummond	Salary	Annual	RIB reviews the stand component for all TFLs. This will expand to include IFPAs and EFMPPs
Sampling	Regions	RIB	Various	Salary/ project	Annual	To include PSPs, VRI, and NVAF
Coordination of the type 1 and type 2 silviculture strategies	Region, district and industry silviculturists, industry and consulting foresters	FPB	Pat Martin Frank Barber Ralph Winter	$40,000	March 31, 2001	The Plan for 2000-2001 • Travel, coordination and monitoring of strategy development • Assisting specific regions and districts with strategy development problems • Development of a web site containing all strategies • Extension, communication and analysis of results of strategies
MOF/Industrial Support Total				**$40,000**		

GY Related Research (veg mgmt, hardwoods, partial cutting, silv systems)						
Red alder, hybrid poplar, aspen propagation, regeneration (SCBC)	FPB, District silviculture staff, industry	RB	Binder, Brown, Conlin	$42,000	March, 2001	Some GY information comes out of the following projects but mostly here for completeness: • Mineral nutrient deficiencies in red alder stands (Brown) • Asexual propagation of trembling aspen (Conlin) • Mineral nutrition of hybrid poplar (Brown) • Risk assessment for UV-B radiation damage (Binder)
Effects of coastal hardwoods on mixed stand development (SCBC)	FPB, VFR, district silviculture staff, industry	RB	Keith Thomas	$143,000	March, 2001	• Ensuring SCBC project is properly archived.

Project Title (funder)	Linkages	Lead Branch	Lead Person	Cost	When Finished	Comments
Management of paper birch and birch mixtures in central BC (SCBC)	FPB, PGFR & other regions, district silv staff, industry	RB	Jain Wang	$41,000	March, 2001	• Ensuring SCBC project is properly archived.
Forest dynamics (base)	FPB, district silviculturists and industry	RB	Louise de Montigny	$20,000	Ongoing	Key outputs: • Completion of a **silviculture research strategy** • Support for stocking standards for broadleaf and mixedwood stands • Variable retention silviculture project • Support district silviculture staff through consultation and extension in stand establishment and tending
Northern mixedwoods (base)	District silviculture staff, industry	RB	Jian Wang	$5,000	March, 2001	• Support district staff and other clients
Vegetation management (SCBC)	Districts, FPB .	RB	de Montigny, Balvinder Biring	$58,000	March, 2001	Several projects; major outputs are: • Evaluation of veg. management treatment options • Development of a prototype vegetation management response model (starting with spruce) • Continued development of young stand model (estimation of early stand development under variety of conditions essential to estimating free growing and green-up) • Ongoing support for monitoring, free-growing and stocking standards (funds under "forest dynamics")
Incremental silviculture of lodgepole pine integration of stand productivity and non-timber values	FPB, district and industry silviculturists, industry and consulting foresters	FPC	Frank Barber --with main work done by Tom Sullivan	$109,000	Ongoing Science Council Project	The Plan for 2000-2001 • Aerial fertilization of trial areas in Cariboo and Kamloops Regions • Measurements, maintenance, and extension on a set of field demonstration areas that provide to forest resource managers an illustration of the impact of intensive silviculture (spacing, pruning, fertilization) on range, biodiversity, wildlife habitat, tree size and value, and other non-timber values in PI
GY Related Research Total				**$418,000**		

Application "Development"/ Guidelines (TSR linkages support, inventory, silv)						

FINAL DRAFT

Project Title (funder)	Linkages	Lead Branch	Lead Person	Cost	When Finished	Comments
FPS Activities (supporting clients)	Chief Forester and TSB (TSR), FPB, districts	RB	Barrie Phillips	$4,000	Ongoing	• Yield table approval (TFLs) • TSB and district silviculture staff require assistance in projecting yields from partial harvesting • Stand dynamics in older stands and non-contributing land base
Method field testing of an OAF estimation method for forest health	TSB, RIB, RB, FPB District and industry silviculturists, industry and consulting timber supply planners	FPB	John Henigman	$8,000	March 31, 2001	The plan for 2000-2001 • Development of a simple forest health OAF methodology for use in timber supply planning which uses existing survey and ISIS data
Development of habitat supply modeling approaches for inclusion in silviculture strategies	FPB, MELP, district and industry silviculturists, industry and consulting timber supply planners involved in silviculture strategy development	FPB	Brian Nyberg, Andy MacKinnon	$115,000	March 31, 2001	The plan involves the development of simple approaches which can • Define different simple indices that represent habitat conditions • Develop simple approaches by which habitat objectives and indices can be included in type 1 and 2 silv strategies • Represent the impact of partial cutting and silviculture activities on habitat objectives at the forest level using simple modeling approaches and existing information sources
Displaying and interpreting non-timber resource values on Stand Density Management Diagrams	FPB and others District and industry silviculturists, industry and consulting foresters	FPB	Pat Martin	$25,000	March 31, 2001	The plan for 2000-2001: • Print the windthrow pamphlet • Develop interpretive brochure(s) for habitat • Revise the commercial thinning pamphlet • Develop beetle-proofing brochure
Application "Development"/ Guidelines Total				**$152,000**		

Training						
How to determine site index in silviculture	FPB District and industry silviculturists, industry and consulting foresters	FPB	Pat Martin	$5,000	March 31, 2001	Deliver through FCSN sessions of this 1-day training course
PrognosisBC	FPB, district and industry silviculturists, industry and consulting foresters	FPB	Barry Snowdon	$5,000	March 31, 2001	Deliver through FCSN sessions of this 1-day training course

Project Title (funder)	Linkages	Lead Branch	Lead Person	Cost	When Finished	Comments
Timber supply training course	TSB, RIB, RB, FPB, district and industry silviculturists, industry and consulting foresters	FPB	Pat Martin	$60,000	March 31, 2001	Forest Practices Branch is doing the financial/contract admin for this Timber Supply Branch Course. Purpose of this training is to ensure operational folk have a better understanding of forest level modelling and to empower them to give more meaningful direction and involvement in the silviculture strategy planning process and ultimately in the timber supply planning process in the future.
Using growth and yield concepts to build effective stand tending programs	FPB, district and industry silviculturists, industry and consulting foresters	FPB	Pat Martin	$5,000	March 31, 2001	Deliver through FCSN sessions of this 2-day training course.
Training Total				**$75,000**		

Regions						
SORTIE (PRER)		RB	??	??	??	
Regions Total						

Tree Improvement						
Various projects		RB	Alvin Yanchuk	??		Some GY related outputs
Tree Improvement Total						

GY Total				**$6,107,000**		